

Interactive comment on “High occurrence of new particle formation events at the Maïdo high altitude observatory (2150 m), Reunion Island (Indian Ocean)” by Brice Foucart et al.

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Interesting paper about the occurrence and diurnal patterns of ultrafine particles at a high elevation tropical site.

However, the conclusions drawn about new particle formation and growth probably need to be revised with a more detailed discussion of diurnal advection processes.

The authors mention and discuss large and small scale atmospheric dynamics in section 2.2 and show picture of a advection pathways (fig. 1). That's important for this study. But, unfortunately the impact of the local diurnal advection processes on the

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aerosol composition at the site mentioned in sections 4.3 and 4.4 is not further discussed despite the clear statement in section 4.3:

“It’s noteworthy that, at high altitudes, the conditions of spatially homogeneous air masses and a steady state, necessary to calculate a realistic growth rate are not verified since air masses are progressively advected to the site from lower altitudes”.

The site is located on top of a 12 km long and 700 m high concave volcanic ridge which is opening to the east. This is a perfect textbook location of an orographic structure for the production of early morning thermals. With these thermals air parcels from either Le Port or from St. Andre arrive at the station about two hours after sunrise, depending on the thermal intensity and well in agreement with the observation the appearance of particles at the site (fig. 10).

The site is thus a perfect location for an advection study of particles produced elsewhere, most likely close to the coastline. But, that would require to characterize in more detail the thermal upwinds and to relate these to the aerosol and other meteorological data and also to discuss the sources and characteristics of ultrafine particles with the upwind areas.

Sources for emissions of primary ultrafine particles in these locations besides traffic are shipping activities in the port (Le Port), a diesel fired power station in Le Port and probably emissions of a sugar refinery and thermal power station in St. Andre. It’s well known that such sources emit particles in the nucleation mode sizes, not only from fossil fuel burning but also from sugar refining. New particle formation via gas to particle conversion during transport naturally cannot be excluded. However, according to Kulmala et al (2013) such a process would take several hours, most likely far more than the two hours of fig. 10 until these new particles would be visible in the SMPS data.

Comparing diurnal patterns of water vapor data from meteorological stations at Le Port or St. Andre and Maïdo and possibly potential temperature calculated from the in situ

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temperature at Mado could be helpful for further analysis.

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